

-R-X<sub>1</sub>-H-X<sub>2</sub>-E- (SEQ ID NO:37), in which

X<sub>1</sub> is G, S, T, C, Y, N, Q, D or E;

X<sub>2</sub> is S or T; and

-G-D-K-X<sub>3</sub>- (SEQ ID NO:38), in which

X<sub>3</sub> is S or T; and

-S-A-Q-X<sub>4</sub>-K- (SEQ ID NO:39), in which

X<sub>4</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V; and

-N-X<sub>5</sub>-T-R- (SEQ ID NO:40), in which

X<sub>5</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V,

provided that when X<sub>1</sub> is D, X<sub>2</sub> is T, X<sub>3</sub> is S, and X<sub>4</sub> is V, then X<sub>5</sub> is not P;

and

c) a 3' non-translated region which functions in plant cells to cause the addition of a stretch of polyadenyl nucleotides to the 3' end of the RNA sequence;

where the promoter is heterologous with respect to the structural DNA sequence and adapted to cause sufficient expression of the encoded EPSPS enzyme to enhance the glyphosate tolerance of a plant cell transformed with the DNA molecule.

7. (Amended) A DNA molecule of claim 6 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

9. (Amended) A DNA molecule of claim 8 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

15. (Amended) A method of producing genetically transformed plants which are tolerant toward glyphosate herbicide, comprising the steps of:

a) inserting into the genome of a plant cell a recombinant, double-stranded DNA molecule comprising:

i) a promoter which functions in plant cells to cause the production of an RNA sequence,

ii) a structural DNA sequence that causes the production of an RNA sequence which encodes an EPSPS enzyme having the sequence domains:

-R-X<sub>1</sub>-H-X<sub>2</sub>-E- (SEQ ID NO:37), in which

X<sub>1</sub> is G, S, T, C, Y, N, Q, D or E;

X<sub>2</sub> is S or T; and

-G-D-K-X<sub>3</sub>- (SEQ ID NO:38), in which

X<sub>3</sub> is S or T; and

-S-A-Q-X<sub>4</sub>-K- (SEQ ID NO:39), in which

X<sub>4</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V; and

-N-X<sub>5</sub>-T-R- (SEQ ID NO:40), in which

X<sub>5</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V,

provided that when X<sub>1</sub> is D, X<sub>2</sub> is T, X<sub>3</sub> is S, and X<sub>4</sub> is V, then X<sub>5</sub> is not P;

and

iii) a 3' non-translated DNA sequence which functions in plant cells to cause the addition of a stretch of polyadenyl nucleotides to the 3' end of the RNA sequence;

where the promoter is heterologous with respect to the structural DNA sequence and adapted to cause sufficient expression of the polypeptide to enhance the glyphosate tolerance of a plant cell transformed with the DNA molecule;

b) obtaining a transformed plant cell; and  
c) regenerating from the transformed plant cell a genetically transformed plant which has increased tolerance to glyphosate herbicide.

17. (Amended) A method of claim 16 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

20. (Amended) A method of claim 19 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:42 and SEQ ID NO:44].

32. (Amended) A method for selectively controlling weeds in a field containing a crop having planted crop seeds or plants comprising the steps of:

a) planting the crop seeds or plants which are glyphosate-tolerant as a result of a recombinant double-stranded DNA molecule being inserted into the crop seed or

plant, the DNA molecule having:

i) a promoter which functions in plant cells to cause the production of an RNA sequence,

ii) a structural DNA sequence that causes the production of an RNA sequence which encodes an EPSPS enzyme having the sequence domains:

-R-X<sub>1</sub>-H-X<sub>2</sub>-E- (SEQ ID NO:37), in which

X<sub>1</sub> is G, S, T, C, Y, N, Q, D or E;

X<sub>2</sub> is S or T; and

-G-D-K-X<sub>3</sub>- (SEQ ID NO:38), in which

X<sub>3</sub> is S or T; and

-S-A-Q-X<sub>4</sub>-K- (SEQ ID NO:39), in which

X<sub>4</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V; and

-N-X<sub>5</sub>-T-R- (SEQ ID NO:40), in which

X<sub>5</sub> is A, R, N, D, C, Q, E, G, H, I, L, K, M, F, P, S, T, W, Y or V,

provided that when X<sub>1</sub> is D, X<sub>2</sub> is T, X<sub>3</sub> is S, and X<sub>4</sub> is V, then X<sub>5</sub> is not P;

and

iii) a 3' non-translated DNA sequence which functions in plant cells to cause the addition of a stretch of polyadenyl nucleotides to the 3' end of the RNA sequence,

where the promoter is heterologous with respect to the structural DNA sequence and adapted to cause sufficient expression of the EPSPS enzyme to enhance the glyphosate tolerance of the crop plant transformed with the DNA molecule; and

b) applying to the crop and weeds in the field a sufficient amount of

glyphosate herbicide to control the weeds without significantly affecting the crop.

34. A method of claim 33 in which the structural DNA sequence encodes an EPSPS enzyme selected from the sequences as set forth in SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:42 and SEQ ID NO:44].

37. (Amended) A method of claim 36 in which the structural DNA sequence encodes an EPSPS enzyme selected from the sequences as set forth in SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

53. (Amended) A DNA molecule of claim 49 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44].

54. (Amended) A DNA molecule of claim 50 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44].

55. (Amended) A DNA molecule of claim 51 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44].

56. (Amended) A DNA molecule of claim 52 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44].

57. (Amended) A DNA molecule of claim 53 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

58. (Amended) A DNA molecule of claim 54 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

59. (Amended) A DNA molecule of claim 55 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

60. (Amended) A DNA molecule of claim 56 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

69. (Amended) A glyphosate-tolerant plant cell of claim 25 in which:

(a) the promoter is selected from the group consisting of CaMV 35S and FMV 35S promoters;

- (b) the structural DNA sequence encodes:
  - (i) a chloroplast transit peptide selected from the group consisting of SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15 and SEQ ID NO:17; and
  - (ii) an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44]; and
- (c) the 3' non-translated region is selected from the group consisting of the NOS 3' and the E9 3' non-translated regions.

70. (Amended) A glyphosate-tolerant plant cell of claim 69 in which the structural DNA sequence comprises:

- (a) a chloroplast transit peptide encoding DNA sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14 and SEQ ID NO:16; and
- (b) an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

74. (Amended) A glyphosate-tolerant plant comprising a DNA molecule of claims 5, 8 or 10 in which:

- (a) the promoter is selected from the group consisting of CaMV 35S and FMV 35S promoters;
- (b) the structural DNA sequence encodes:
  - (i) a chloroplast transit peptide selected from the group consisting of SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15 and SEQ ID NO:17; and

(ii) an EPSPS enzyme selected from the group consisting of SEQ ID NO:3, SEQ ID NO:5, and SEQ ID NO:7[, SEQ ID NO:42 and SEQ ID NO:44]; and

(c) the 3' non-translated region is selected from the group consisting of the NOS 3' and the E9 3' non-translated regions.

75. (Amended) A glyphosate-tolerant plant of claim 74 in which the structural DNA sequence comprises:

(a) a chloroplast transit peptide encoding DNA sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14 and SEQ ID NO:16; and

(b) an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:2, SEQ ID NO:4, and SEQ ID NO:6[, SEQ ID NO:41 and SEQ ID NO:43].

88. (New) A DNA molecule of claim 6 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.

89. (New) A DNA molecule of claim 8 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.



90. (New) A method of claim 16 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.

91. (New) A method of claim 19 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44.

92. (New) A method of claim 33 in which the structural DNA sequence encodes an EPSPS enzyme selected from the sequences as set forth in SEQ ID NO:42 and SEQ ID NO:44.

93. (New) A method of claim 36 in which the structural DNA sequence encodes an EPSPS enzyme selected from the sequences as set forth in SEQ ID NO:41 and SEQ ID NO:43.

94. (New) A DNA molecule of claim 49 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44.

95. (New) A DNA molecule of claim 50 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44.

96. (New) A DNA molecule of claim 51 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44.

97. (New) A DNA molecule of claim 52 in which the structural DNA sequence encodes an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44.

98. (New) A DNA molecule of claim 53 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.

99. (New) A DNA molecule of claim 54 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.

100. (New) A DNA molecule of claim 55 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.

101. (New) A DNA molecule of claim 56 in which the structural DNA sequence contains an EPSPS encoding sequence selected from the group consisting of

SEQ ID NO:41 and SEQ ID NO:43.

102. (New) A glyphosate-tolerant plant cell of claim 25 in which:

(a) the promoter is selected from the group consisting of CaMV 35S and FMV 35S promoters;

(b) the structural DNA sequence encodes:

(i) a chloroplast transit peptide selected from the group consisting of SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15 and SEQ ID NO:17; and

(ii) an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44; and

(c) the 3' non-translated region is selected from the group consisting of the NOS 3' and the E9 3' non-translated regions.

103. (New) A glyphosate-tolerant plant cell of claim 69 in which the structural DNA sequence comprises:

(a) a chloroplast transit peptide encoding DNA sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14 and SEQ ID NO:16; and

(b) an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43

104. (New) A glyphosate-tolerant plant comprising a DNA molecule of claims 5, 8 or 10 in which:

- (a) the promoter is selected from the group consisting of CaMV 35S and FMV 35S promoters;
- (b) the structural DNA sequence encodes:
- (i) a chloroplast transit peptide selected from the group consisting of SEQ ID NO:11, SEQ ID NO:13, SEQ ID NO:15 and SEQ ID NO:17; and
- (ii) an EPSPS enzyme selected from the group consisting of SEQ ID NO:42 and SEQ ID NO:44; and
- (c) the 3' non-translated region is selected from the group consisting of the NOS 3' and the E9 3' non-translated regions.

105. (New) A glyphosate-tolerant plant of claim 74 in which the structural DNA sequence comprises:

- (a) a chloroplast transit peptide encoding DNA sequence selected from the group consisting of SEQ ID NO:10, SEQ ID NO:12, SEQ ID NO:14 and SEQ ID NO:16; and
- (b) an EPSPS encoding sequence selected from the group consisting of SEQ ID NO:41 and SEQ ID NO:43.